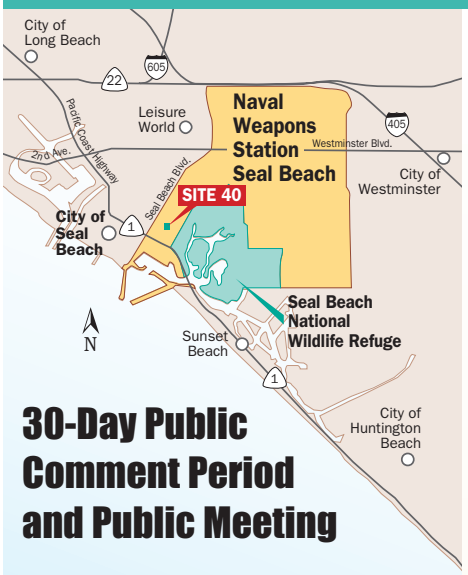
PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN

Installation Restoration Program—Site 40

NAVAL WEAPONS STATION SEAL BEACH

AUGUST 2003



30-Day Public Comment Period and Public Meeting

PUBLIC COMMENT PERIOD

August 29–September 27, 2003

We encourage you to comment on this Proposed Plan during the 30-day public comment period. You can submit written or oral comments at the public meeting or mail, e-mail, or fax written comments ***(postmarked no later than September 27, 2003****) to: Ms. Pei-Fen Tamashiro (Code: N45WW), IR Program Manager , NAVWPNSTA Seal Beach, 800 Seal Beach Blvd., Building 110, Seal Beach, CA 90740; to Ms. Tamashiro by fax (562) 626-7131; or e-mail tamashiro.peifen@sbeach.navy.mil. Public comments received during this period and at the public meeting will be considered in selecting the final remedy for Site 40.*

PUBLIC MEETING

September 16, 2003—7 to 9 p.m.

LOCATION

Seal Beach City Council Chambers
211 8th Street, Seal Beach, CA

Navy representatives will make a presentation on the Site 40 environmental investigations and the cleanup alternatives evaluated. You will have the opportunity to ask questions and formally comment orally or in writing on the preferred remedy and the other alternatives.

Navy Proposes Groundwater Cleanup Plan, Requests Public Comments

PROPOSED PLAN SUMMARY

Pages 1 through 3 of this Proposed Plan/Draft Remedial Action Plan (also referred to as the Proposed Plan) provide a short summary of the environmental investigation results and the Navy's cleanup recommendation for Site 40. If you would like to read more in-depth information that forms the basis of the cleanup recommendation, please see the Table of Contents below.

The Navy invites you to provide comments concerning the proposed cleanup alternatives for the ***Installation Restoration (IR) Program**** at Site 40 located at the Naval Weapons Station (NAVWPNSTA) Seal Beach (see box at left for further details on how and when to send your comments).

The Proposed Plan/Draft Remedial Action Plan also meets the ***remedial (cleanup) action*** plan requirements of the California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC), the lead oversight agency for the state. The California Health and Safety Code spells out the documentation requirements for draft and final remedial action plans. The selection of the final remedy for Site 40 will be documented in the ***Record of Decision***/Final Remedial Action Plan (ROD/RAP).

The IR Program is a comprehensive environmental investigation and cleanup program to identify, investigate, and clean up chemical contamination that resulted from past Station practices. Figure 1 on page 2 shows the IR Program process for Site 40. Site 40 is located at the Station's locomotive repair shop, see Figure 2 map on page 3.

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*Words in ***bold italic*** type are defined in the glossary on page 7.

Environmental Conditions at Site 40

Site 40 has two distinct environmental components, ***soil*** and ***groundwater.*** Industrial activities conducted at the locomotive repair shop, from the mid-1940s to the late 1970s, resulted in discharge of ***volatile organic compounds (VOCs)***, principally from industrial solvents, to soil and groundwater. VOCs are contained in industrial solvents used for cleaning and degreasing. The primary VOC at Site 40 is tetrachloroethene (PCE). Other VOCs present include trichloroethene (TCE), and to a much lesser extent, cis-1,2-dichloroethene (DCE), and vinyl chloride (VC). Extensive field investigations and laboratory analysis of soil and groundwater were conducted. An assessment of potential risks to human health and the environment was also performed. This risk screening assessment determined potential risks from exposure to contaminants in soil and groundwater at Site 40.

Results of soil sampling indicated that most of the original releases of VOCs have already moved into the groundwater or evaporated into the air. Based on the environmental studies and risk screening assessment, the Navy determined that no cleanup action is necessary for soil at Site 40.

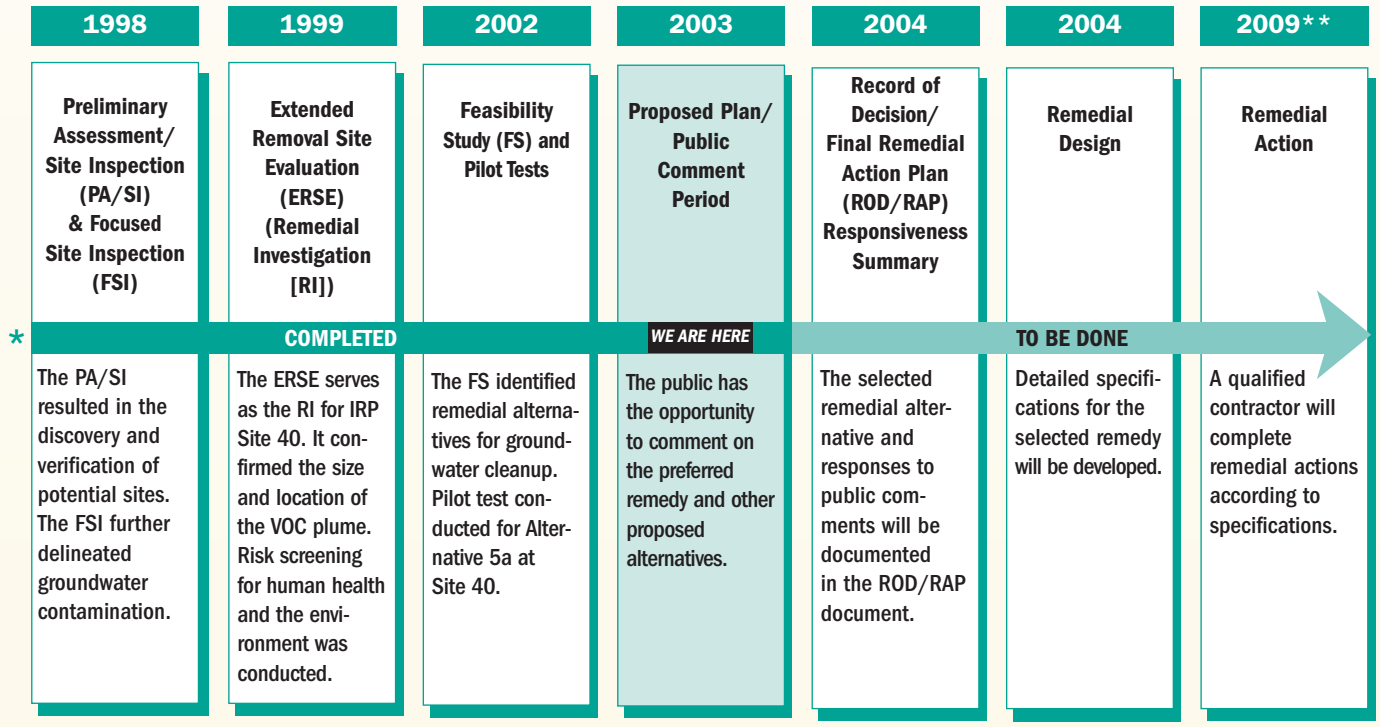
VOCs are present in the shallow groundwater ***aquifer*** forming a ***plume*** approximately 250 by 450 feet reaching a depth of 66 feet below the surface at Site 40. VOCs reported in groundwater are at concentrations or amounts that could adversely affect human health if this water were ever used for domestic purposes such as drinking, cooking, or bathing. Specifically, the amounts of VOCs exceed the state and federal primary ***maximum contaminant levels (MCLs)***. MCLs are enforceable standards. They represent the maximum allowable level of specific contaminants in water that is provided by a public water system and delivered to customers or users. MCLs are generally used to gauge whether cleanup action is warranted. Table 1 on page 3 lists the criteria and standards for VOCs in groundwater at Site 40.

Although the affected groundwater beneath Site 40 is not currently used for domestic purposes due to its high salinity and hardness, cleanup of VOCs is required. The Navy's cleanup recommendation for groundwater is based on the results of extensive field studies, groundwater monitoring, and the results of the risk screening assessment. Cleanup of VOCs in groundwater is necessary to control migration or movement of VOCs and reduce VOCs in groundwater to levels that are protective of human health and the environment and in compliance with water quality standards.

Navy's Preferred Remedy for Groundwater Cleanup

Six remedial alternatives were developed and evaluated for cleaning up contaminated groundwater at Site 40. The Navy's preferred remedy is Alternative 5a, ***In Situ*** Treatment—Enhanced Bioremediation. It would use an innovative technology where treatment occurs in place

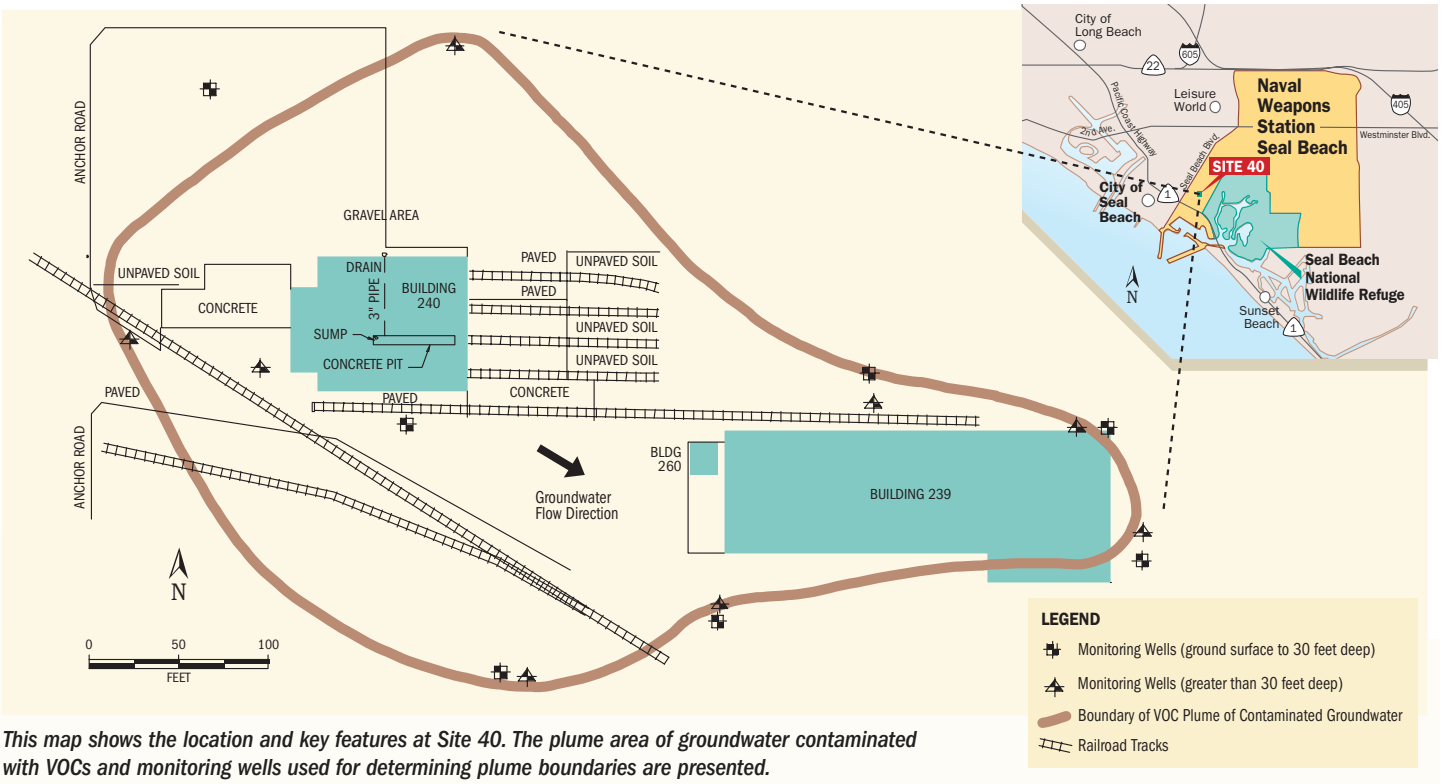
FIGURE 1: ***Installation Restoration Program Process—Site 40***



***The arrow shows the status of Site 40.**
****Assumes cleanup goals will be achieved in 5 years using the preferred remedy.**

Words in ***bold italic*** type are defined in the glossary on page 7.

FIGURE 2: Site 40 Location



This map shows the location and key features at Site 40. The plume area of groundwater contaminated with VOCs and monitoring wells used for determining plume boundaries are presented.

below the ground surface. This involves pumping a mixture of sodium lactate (an environmentally safe substance used in the food industry) and tap water into the contaminated groundwater at Site 40. As planned for use at Site 40, sodium lactate will not harm soil, groundwater, vegetation, or wildlife. This process would enhance the ability of naturally occurring bacteria present in groundwater to ***biodegrade*** or convert VOCs to harmless, non-hazardous by-products. These bacteria break down the complex VOCs into simpler molecules. This initial phase of ***biodegradation*** treatment would greatly reduce the concentrations and amount of VOCs in groundwater at Site 40. Alternative 5a also includes a follow-up component called ***monitored natural attenuation (MNA).*** During the MNA phase, natural biodegradation of VOCs continues to occur without adding any nutrients to the groundwater. The Navy's preferred remedy also includes ***institutional controls*** in the form of land-use controls to prevent use of groundwater, allow for access to conduct the cleanup and perform monitoring and maintenance, and protect treatment equipment and monitoring wells.

TABLE 1: Criteria and Standards for VOCs in Groundwater at Site 40

Chemical VOC	Concentration (micrograms per liter)		
	GOAL U.S. EPA Maximum Contaminant Level (MCL)[1]	GOAL California Maximum Contaminant Level (MCL)[1]	ACTUAL Maximum Reported Concentration[2]
Tetrachloroethene (PCE)	5	5	3,940[2]
Trichloroethene (TCE)	5	5	273[2]
cis-1,2-Dichloroethene (DCE)	70	6	1,500[3]
Vinyl Chloride (VC)	0.5	2	1[3]

Sources:
Federal and state cleanup standards are established in 40 Code of Federal Regulations §141.61(a) and Title 22 California Code of Regulations §64444, respectively.

Notes:
1) All values reported in micrograms per liter.
2) Maximum reported concentrations from monitoring results reported in the Extended Removal Site Evaluation Report.
3) Maximum reported concentrations from the *In Situ* Bioremediation Pilot Test.

Navy Requests Public Input

The Navy invites the public to provide input on this Proposed Plan during the August 29–September 27, 2003 public comment period. A final decision will be made after the public comment period has ended and all comments have been reviewed and considered. The selection of the final remedy for cleanup of Site 40 will be documented in the ROD/RAP and public comments will be addressed in the Responsiveness Summary portion of that document, see page 18, "Next Step for Site 40." Environmental investigation reports that provide the basis for selecting the remedy are available for review, see page 9 for these locations.

ENVIRONMENTAL INVESTIGATION OVERVIEW

NAVWPNSTA Seal Beach History

NAVWPNSTA Seal Beach is located on the Pacific coast within the city of Seal Beach in Orange County, California. The Station comprises approximately 5,000 acres of land and a port area, with about 911 acres in the southwest portion of the Station designated as the Seal Beach National Wildlife Refuge. Cities surrounding the Station include Los Alamitos, Westminster, Huntington Beach, and Seal Beach.

The Station was originally commissioned in 1944, at the height of World War II, as a Naval Ammunition and Net Depot. The name has changed several times, but in 1998 the base was redesignated Naval Weapons Station Seal Beach. It is one of several weapons stations maintained by the Navy to provide fleet combatants with ready-for-use ***ordnance.*** The Station includes a headquarters with central and administrative support detachments as well as storage, testing, and production facilities that support the Station's mission. NAVWPNSTA Seal Beach serves as a supply point for two-thirds of the Navy and Marine Corps forces operating in the Pacific.

Building 240, which houses the NAVWPNSTA Seal Beach locomotive repair facility, is shown. Next to the building is the gravel area (much of it is now paved) where wastes that caused groundwater to become contaminated were discharged.

Installation Restoration (IR) Program

In the past, some hazardous waste disposal practices at NAVWPNSTA Seal Beach, although acceptable at the time, resulted in the release of pollutants into surrounding soil and groundwater. The Department of Defense is investigating and cleaning up these sites through its IR Program. The goal of the Navy's IR Program is to protect human health and the environment through compliance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA, also known as "Superfund").

NAVWPNSTA Seal Beach is actively working with state and local environmental regulatory agencies in a team effort to achieve and maintain a healthy environment for the Station and surrounding communities. IR Program cleanup partners consist of NAVWPNSTA Seal Beach, Cal/EPA's Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board (RWQCB), and the Orange County Department of Environmental Health Services. The Navy is the lead federal agency for the IR Program. DTSC is the lead state regulatory agency for the IR Program, and RWQCB provides technical oversight of IR sites with water quality concerns and underground storage tanks at the Station, see Figure 3 below left.

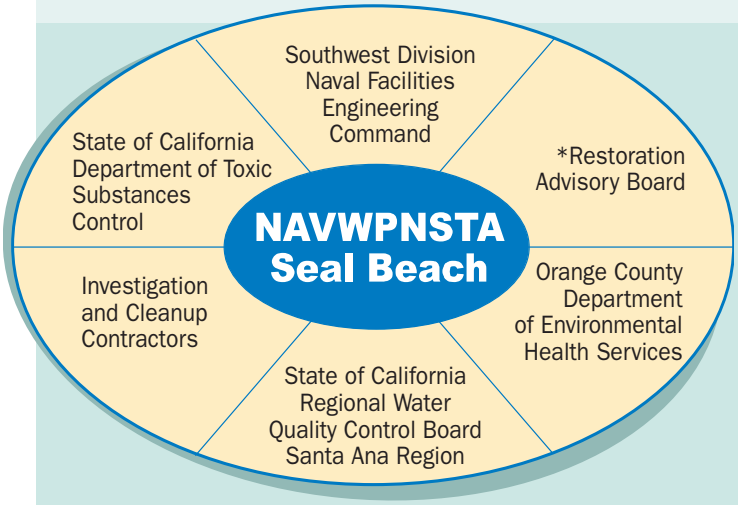


FIGURE 3: ***NAVWPNSTA Seal Beach Cleanup Team***

** See page 19 for more information on the role community members play on the NAVWPNSTA Seal Beach Restoration Advisory Board.*

Since 1985, 73 potential hazardous waste locations have been identified at NAVWPNSTA Seal Beach through the IR Program. Site 40 is the focus of this Proposed Plan. In 1991, these sites were categorized into different ***operable units (OUs)*** to more effectively manage the IR Program. For more information on the overall status of the IR Program at NAVWPNSTA Seal Beach, contact Ms. Pei-Fen Tamashiro, see page 16.

Background—Site 40

At NAVWPNSTA Seal Beach, the Navy uses its own locomotives and railcars to transport ordnance between storage facilities and Navy ships docked at the Station's wharf. Site 40, also referred to as the Concrete Pit/Gravel Area, includes a concrete pit located in the locomotive repair shop (Building 240) and an adjacent gravel area. From the mid-1940s to 1978, the concrete pit served as a collection point for oil and solvents spilled during locomotive maintenance activities. The waste oils and solvents were discharged from the pit to

Words in ***bold italic*** type are defined in the glossary on page 7.

the gravel area through a drain pipe until 1978 when the pipe was capped. A portion of the gravel area is paved with asphalt and the remaining portion is unpaved. Four railroad spurs terminate in Building 240 and provide locomotive access to the repair shop. Additional tracks traverse the asphalt-paved area to the south. The waste solvents have contaminated the groundwater beneath the site.

Environmental Studies Conducted

To study hazardous waste sites in an efficient and cost-effective manner at NAVWPNSTA Seal Beach, numerous sites are often investigated simultaneously. Site 40 was first identified in 1989 in a study that was performed to determine whether there had been, or were likely to be, releases of hazardous substances from locations where hazardous wastes or materials had been used, treated, stored, or disposed of. Key studies and results are presented below:

- In 1990, a ***preliminary assessment*** of several sites recommended further study of Site 40 and 25 other sites.
- In 1995, a ***site inspection*** was conducted. The site inspection showed that two chemicals of potential concern, carbon tetrachloride and tetrachloroethene (PCE), had been released to the ***groundwater*** at Site 40. These chemicals are industrial solvents generally used in maintenance and cleaning activities and are categorized as ***volatile organic compounds*** or ***VOCs***. Further study was recommended to evaluate the nature and extent of these chemicals in the groundwater.
- In 1996, a ***focused site inspection*** was performed in conjunction with further investigations at seven additional sites. The focused site inspection concluded that a ***plume*** of VOCs containing PCE, trichloroethene (TCE), and 1,2-dichloroethene (DCE) was present in groundwater beneath Site 40. The study determined the plume in shallow groundwater covered an area of approximately 270 by 220 feet, but the depth was not known. These chemicals were detected at levels exceeding state and federal limits and further action was recommended.
- In 1998, an ***extended removal site evaluation (ERSE)*** was conducted at Site 40 to supplement data from the previous investigations. The ERSE was a comprehensive investigation that served as the ***remedial investigation (RI)***, a key step in the IR Program process, for investigating hazardous waste sites. The ERSE included soil and groundwater sampling and provided information that enabled the Navy to better define the nature and extent of soil and groundwater contamination and evaluate potential threats to human health and the environment. The information gathered during the ERSE was used to refine the Navy's understanding of the subsurface conditions and the migration of chemicals in groundwater. A screening-level health risk assessment was conducted to determine the potential exposure routes of chemicals to people and the environment and estimate the risk from such exposure. See page 8 for more information on the risk assessment.
- Beginning in 2000, based on recommendations in the ERSE, groundwater monitoring has been performed to keep track of the VOC plume at Site 40. A groundwater monitoring program was implemented that included installation of five new wells. Groundwater samples from 15 wells in and around the plume were collected for laboratory analysis on a quarterly basis during the first year of the monitoring program and annually thereafter. Samples were analyzed for VOCs and ***natural attenuation*** factors to determine if natural conditions and processes occurring in the groundwater are capable of reducing concentrations of contaminants. Groundwater monitoring also shows if the extent and chemistry of the plume are changing over time.

Drillers and geologists install one of the monitoring wells used for collecting groundwater samples at Site 40.

At Site 40, waste oils and solvents were discharged from the concrete pit, at the locomotive repair shop in Building 240, to the gravel area outside the building through this drainage pipe, which was capped in 1978.

Environmental Investigation Conclusions

Soil—Investigation Conclusions

The ERSE concluded that the potential for movement of VOCs from the soil to groundwater is negligible. Results of soil sampling indicated that most of the original releases of VOCs to the soil have already migrated to the groundwater or evaporated into the air. Metals were identified in the soil at Site 40 at background (naturally occurring) levels for soils found throughout NAVWPNSTA Seal Beach; therefore, soils were ruled out as a health or environmental concern.

The ERSE further concluded that the human-health risk for soils is below the ***point of departure*** for taking action, as defined in the National Oil and Hazardous Substances Contingency Plan (NCP), the federal regulation that guides the determination of human-health risks for hazardous wastes. See page 8 for more information on the human-health risk screening assessment. Also, there is no adverse impact to the ecology since this is an industrial setting with no wildlife or habitat present.

Based on the study results, the Navy, with concurrence from the regulatory agencies, has concluded that no further action is needed for soil at Site 40.

Groundwater—Investigation Conclusions

The ERSE determined that the groundwater plume primarily contains PCE. Other VOCs present are TCE, and to a much lesser extent, DCE. PCE and TCE were determined to be the VOCs of concern in groundwater. Data from the ERSE and the quarterly groundwater monitoring program show that the plume is approximately 250 by 450 feet reaching a depth of 66 feet below the surface at Site 40. The plume is moving slowly toward the Seal Beach National Wildlife Refuge and its marshes located within the boundaries of NAVWPNSTA Seal Beach. VOCs are present only in the shallow aquifer beneath the site and have not migrated or moved into the deeper regional aquifer. Groundwater monitoring shows that there is a negligible potential for the plume to move beyond the boundaries of NAVWPNSTA Seal Beach. Investigation results also show that natural attenuation is occurring and contributing to a reduction of VOCs present in the center of the plume.

Groundwater in the shallow ***aquifer*** contains concentrations or levels of VOCs that exceed the state and federal primary ***maximum contaminant levels (MCLs).*** MCLs are enforceable standards. They represent the maximum allowable level of specific contaminants in water that is provided by a public water system and delivered to customers or users. MCLs are generally used to gauge whether ***remedial (cleanup) action*** is warranted.

Groundwater in the shallow aquifer does not currently serve as a source for domestic use (drinking, cooking, bathing). Also, it is not expected to be used as a domestic water source in the future due to its natural high salinity and hardness. However, if this water was ever used for domestic purposes, the human-health risk screening shows that exposure to VOCs in groundwater from the plume could have an adverse impact on human health from ingestion (drinking), direct skin contact (bathing or touching the water), or inhalation (steam from showering or washing dishes).

Based on the concentrations of VOCs in groundwater and the human-health risk screening results, cleanup of the VOC plume is required. Cleanup of groundwater will bring the levels of VOCs into compliance with water quality standards.

An extensive ***feasibility study (FS)*** was conducted to develop and evaluate remedial alternatives to address the VOC plume in groundwater at Site 40. The alternatives consist of combinations of cleanup technologies that prevent migration of contaminated groundwater and reduce concentrations of VOCs in groundwater. As part of the FS, a pilot test was conducted at Site 40 to help determine the technical and economic feasibility of an ***in situ bioremediation*** technology that was recommended for further evaluation. The pilot test analyzed the capability of this technology to clean up and reduce the amount of VOCs in groundwater. Details of the pilot test are presented beginning on page 10. The cleanup objectives and remedial alternatives that were developed are summarized beginning on page 12.

Did You Know?

You can read more about the Navy's environmental program on the Internet!

The Naval Weapons Station Seal Beach IR Program Web Page address is: http://www.sbeach.navy.mil/Programs/Environmental/IR/IR.htm

The Navy's Southwest Division Environmental Web Page address is http://www.efdsw.navfac.navy.mil/environmental/envhome.htm

Words in ***bold italic*** type are defined in the glossary on page 7.

GLOSSARY OF TERMS

Aquifer—An underground geological formation containing groundwater in sufficient amounts to serve as a source of water for supply wells.

ARARs—Federal or state environmental statutes, standards, requirements, criteria, or limitations determined to be legal and applicable or relevant and appropriate requirements for addressing specific conditions to protect human health and the environment or use of cleanup technologies at a hazardous waste site.

Biodegrade/Biodegradation—Refers to the process where contaminants are capable of being decomposed or transformed by natural biological processes.

Bioremediation—Refers to the use of non-harmful living organisms to clean up or remove contaminants from soil or water.

Extended Removal Site Evaluation (ERSE)—A detailed environmental investigation that further evaluates site conditions, the presence and extent of contamination, and risk to human health and the environment. For Site 40, this is the equivalent of a remedial investigation.

Feasibility Study (FS)—A phase in the environmental investigation process that develops and evaluates the suitability of appropriate cleanup remedies or solutions.

Focused Site Inspection (FSI)—An extension of the site inspection that focuses on obtaining additional data. Soil and groundwater samples are collected and analyzed to further determine site conditions.

Granular Activated Carbon (GAC) Adsorption—A filtering system used to remove organic contaminants from water. Contaminants adsorb (stick or adhere) to the carbon granules in the cleanup system.

Groundwater—Water within the earth that moves through permeable rock, sand, or gravel.

In situ—Refers to treatment systems that treat contaminants "in place." One example is the treatment of contaminated groundwater beneath a hazardous waste site.

Installation Restoration (IR) Program—A comprehensive environmental program developed by the Department of Defense (DoD) to identify, investigate, and clean up hazardous waste sites at all DoD facilities (Navy, Army, Air Force, Marine Corps).

Institutional Controls—Land-use controls to prevent use of contaminated groundwater and to protect wells and other equipment used to implement a cleanup remedy.

Maximum Contaminant Levels (MCLs)—The maximum permissible level of a contaminant in water delivered to any user of a public water system. MCLs are enforceable standards.

Monitored Natural Attenuation (MNA)—Refers to the routine sampling and testing of groundwater to assess the cleanup effectiveness of natural attenuation processes.

Natural Attenuation—The process by which a compound is reduced in concentration over time, through adsorption (adhere or bind) to saturated soil particles in the subsurface, biodegradation, dilution, and/or transformation.

Operable Units (OUs)—Groups of one or more IR Program sites that share common characteristics or are geographically close together. Site 40 is part of OU-4, which is composed of 16 IR sites.

Ordnance—Military supplies, including weapons and ammunition. Unexploded ordnance—remnants of intact ordnance from earlier activities—may present a safety hazard. No ordnance is present at Site 40.

Plume—A three-dimensional zone within the groundwater aquifer containing contaminants that generally move in the direction of, and with, groundwater flow.

Point of Departure—The threshold or level of contamination below which risk to human health is unconditionally acceptable, according to the NCP.

Preliminary Assessment (PA)—The process of collecting and reviewing available information about a known or suspected waste site or release.

Preliminary Remediation Goals (PRGs)—Concentrations of chemicals in soil and groundwater that represent an acceptable level of risk to human health and the environment. PRGs are used as a screening tool to identify sites that need no further investigation or cleanup action because they have no potential for adverse effects on human health and the environment. These are risk-based concentrations established by U.S. EPA and Cal/EPA.

Record of Decision (ROD)—A public document that explains what cleanup alternative will be used at a specific IR Program site. The ROD is based on information and technical analysis generated during the remedial investigation and feasibility study and consideration of public comments and community concerns.

Remedial (Cleanup) Action—The long-term cleanup action that is carried out to remove the risk to human health and the environment caused by contaminants at a site.

Remedial Investigation (RI)—One of the two major studies that must be completed before a decision can be made about how to clean up an Installation Restoration Program site. The RI is designed to determine the nature and extent of contamination at the site. For Site 40, the ERSE serves as the RI. (The FS is the second major study.)

Site Inspection (SI)—Evaluation of information collected on a hazardous waste site to determine if an immediate threat is present that requires removal of contaminants and to further determine if more in-depth evaluation is required.

Soil—Refers to areas at Site 40 that consist of dirt, sand, or gravel that are present on the surface of the ground or below the surface.

Volatile Organic Compounds (VOCs)—Organic (carbon containing) compounds that evaporate readily at room temperature. VOCs are commonly used in the dry cleaning, metal plating, and machinery degreasing operations. At Site 40, VOCs of concern are: PCE (tetrachloroethene); TCE (trichloroethene); and DCE (dichloroethene).

Words in ***bold italic*** type are defined in the glossary on page 7.

Human-Health and Ecological Risk Screening Assessments

The Navy conducted human-health and ecological screening risk assessments during the Extended Removal Site Evaluation or ERSE to assess potential impacts from contaminants at Site 40 on human health, plants, and animals. The National Oil and Hazardous Substances Contingency Plan or NCP, the regulation established for assessing hazardous waste sites, provides guidelines to be used to assess the types of chemicals, degree of exposure to the chemicals, and potential toxic effects of the chemicals of concern. Screening risk assessments document the risks and hazards under current conditions at the site and provide information for determining if further actions are needed.

Human-Health Risk Screening Procedures

The human-health screening risk assessment was conducted for chemicals identified at Site 40. This assessment used the maximum concentrations of chemicals reported in Site 40 soil and groundwater samples and the specific chemical concentrations that represent an acceptable level of risk as determined by the U.S. Environmental Protection Agency (U.S. EPA) and Cal/EPA. The agency-established concentrations that represent an acceptable level of risk are called ***preliminary remediation goals (PRGs).***

For soil, the human-health screening risk assessment was performed using the PRGs for both residential and industrial soils, even though the current and planned future use of Site 40 is for continued industrial use to support Station activities. For groundwater, risk was assessed using tap water PRGs. This is conservative because sites that do not pose an unacceptable risk under residential exposure conditions will not pose an unacceptable risk under industrial scenarios.

When the regulatory agencies developed the PRGs, they considered various ways people could be exposed to the chemicals in soil and groundwater. Exposure routes incorporated into the PRGs include ingestion (incidentally eating soil, drinking the water), direct skin contact with soil (touching), and inhalation (from soils by breathing in dust, soil particles, or vapors; and from groundwater by breathing in vapors transferred into air during showering, washing dishes, and toilet use). Exposure conditions used by the regulatory agencies in the development of the PRGs are chosen to represent reasonable maximum exposures. When the PRGs are used in conjunction with the maximum concentration in a screening risk assessment, the result is an overestimate of actual risks. This effort to overestimate risk is deliberate because it provides a margin of safety for protecting public health and making site decisions.

The PRGs for chemicals of potential concern are based on cancer-causing (carcinogenic) and non-cancer (noncarcinogenic) effects on human health. Those based on carcinogenic effects of chemicals correspond to the NCP-defined point of departure of a lifetime cancer risk of 1×10^{-6} (1 additional cancer case in 1 million). In other words, for every million people that could be exposed over a 30-year period, one additional cancer case may occur as a result of exposure to site contaminants. One additional cancer case means that one more person could get cancer from chemicals present at a site than would normally be expected to get cancer from all other causes.

For non-cancer health effects, the PRG corresponds to hazard index of 1. A hazard index of 1 or greater indicates that a lifetime of exposure to the chemical(s) may have potential for causing adverse health effects (e.g., respiratory or kidney problems) and should be evaluated further.

For each chemical of concern in soil and groundwater, cancer and non-cancer risks are calculated by the ratio of the maximum reported chemical concentration and the cancer or non-cancer based PRG, respectively.

Soil—Screening Risk Assessment Results

The cancer risk for soil exposure at Site 40 was estimated below the NCP-defined point of departure at 5×10^{-7} (5 additional cases in 10 million) and 9.0×10^{-8} (9 additional cases in 100 million) for the residential and industrial land use scenarios, respectively. The residential scenario hazard index was estimated at 2.8 over the threshold of 1. This estimate is, however, primarily attributable to naturally occurring metals (manganese, antimony, arsenic and aluminum). For the industrial scenario, the hazard index was estimated at 0.14.

Screening for lead in soil was also conducted. The estimated lead concentrations in blood for a resident child, adult, or an industrial worker exposed to Site 40 soil did not exceed 10 micrograms per deciliter or 10 millionth of a gram per liter for each of these individuals. This level has been determined by the State of California to be protective of human health.

Conclusion for Soil—No Action Required

Since the cancer risk is estimated below the NCP-designated criteria, no further action is required for human health cancer risk. The total hazard index for Site 40 soils under the residential land-use scenario is attributable to naturally occurring metals. Therefore, chemicals of potential concern related to past site activities do not pose a significant risk for adverse health effects. In addition, lead concentrations in blood for a hypothetical future resident child, adult, or an industrial worker are within acceptable limits. No cleanup action is needed for soil.

Groundwater—Screening Risk Assessment Results

The cancer risk associated with groundwater at Site 40 was estimated at 4.1×10^{-3}. In other words, for every 1,000 people that could be exposed over a 30-year period, four additional cancer cases may occur as a result of exposure to contaminants. The hazard index for groundwater was estimated at 85, indicating a potential for adverse health

Words in ***bold italic*** type are defined in the glossary on page 7.

effects. PCE and TCE were the main contributors to the cancer risk and to the hazard index.

Conclusion for Groundwater—Cleanup Action Required

The risk to human health from VOC-contaminated groundwater exceeds the NCP-defined acceptable cancer risk and hazard index, triggering the need for cleanup action for groundwater. Groundwater impacted by the plume at Site 40 does not serve as a source of water for any of the beneficial uses designated by the RWQCB and does not pose an immediate threat to human health or the environment. However, further evaluation to determine viable cleanup options is required.

Ecological Risk Screening

The ecological risk screening evaluated the potential effects on ecological receptors (plants and animals) from exposure to chemicals in soil and groundwater at Site 40. Estimated or measured concentrations of chemicals in environmental samples were compared with criteria considered protective of ecological receptors to determine if there is a likelihood of adverse impacts. Ecological risks, like non-cancer human health risks, are expressed in terms of a hazard index. Hazard indexes greater than 1 indicate a potential for adverse effects on wildlife.

Areas at Site 40 are paved, landscaped, occupied by buildings, or covered by bare soil. Vegetation is sparse and dominated by non-native plant communities. The limited habitat is used by wildlife consisting of birds and ground squirrels. This is consistent with other developed areas at the Station. There is no exposure pathway for chemicals in groundwater to reach ecological receptors at the site.

The Seal Beach National Wildlife Refuge is within the Station boundaries and is located approximately 1,000 feet east of Site 40. The refuge supports a large variety of wetland receptors including plants, organisms that live in the mud and silt of the marsh, plankton, various fish, numerous species of birds, and small mammals such as mice and ground squirrels. Because of the refuge's proximity to Site 40, additional data on subsurface conditions have been obtained from groundwater investigations and the monitoring program implemented in 2000 to determine if the VOC plume can reach the marshland and surface water in the refuge. Evaluation of those data shows that the VOC plume has not reached the refuge and that groundwater flows on a downward grade. Coupled with a clay layer in the marsh, this precludes the groundwater flow from reaching surface water in the refuge. Therefore, there is no complete exposure pathway for chemicals in groundwater at Site 40 to reach the refuge. Consequently, there is no opportunity for ecological impact.

Ecological Risk Screening—Results and Conclusions

Hazard indexes associated with exposure to metals and VOCs in soils were greater than 1 for all ecological receptors at Site 40. However, the lack of suitable habitat for foraging and nesting would indicate that wildlife receptors would not use the site. The likelihood of complete pathways to soil with concentrations similar to those used in the assessment is small. The maximum reported concentrations used in the risk screening were from samples obtained from beneath the paved areas. Therefore, it is not likely that chemicals at Site 40 would have an adverse impact on ecological receptors and no actions are required to further protect the ecology.

INFORMATION REPOSITORIES

Site 40 Environmental Investigation and Feasibility Study Reports Available for Review and Comment

Two information repositories have been established to provide public access to technical reports and other IR Program information. The collection of reports used by the Navy and the regulatory agencies to form the basis of the recommendations for Site 40 are available for public review. The key Site 40 documents consist of: Final Extended Removal Site Evaluation Report, Sites 40 and 70 (October 1999) and the Final Groundwater Feasibility Study Report, Sites 40 and 70 (June 2002). These documents, along with other IR Program reports, RAB meeting minutes, newsletters, and environmental documentation, are available for review at the following locations:

Seal Beach Public Library
Mary Wilson Branch
707 Electric Avenue
Seal Beach, CA 90740
(562) 431-3584
(call for library operating hours)

NAVWPNSTA Seal Beach
Environmental Office
800 Seal Beach Blvd., Building 110
Seal Beach, CA 90740
(562) 626-7897 (call for an appointment to obtain entrance to the Station)

Words in ***bold italic*** type are defined in the glossary on page 7.

In Situ Bioremediation Pilot Test

An *in situ* bioremediation (ISB) pilot test was performed to further determine the technical and economic feasibility of this technology at Site 40. Pilot tests were conducted to support the remedy selection process. The 8-month test was conducted from August 2001 to March 2002.

Pilot Test Site Plan with Monitoring Wells

Seven pilot-test wells were installed at Site 40 in areas where the highest concentrations of PCE in groundwater were reported. A diluted solution of sodium lactate (3% sodium lactate, 97% tap water) was periodically injected into one of the monitoring wells and then conditions in the shallow aquifer were monitored. Approximately 55,500 gallons of the solution were injected over the 8-month test period. Prior to, and during the test, samples were collected and analyzed weekly using field test kits to evaluate pilot-test progress. Monthly samples were collected for off-site laboratory analysis. Figure 4 below presents an illustration of the pilot test.

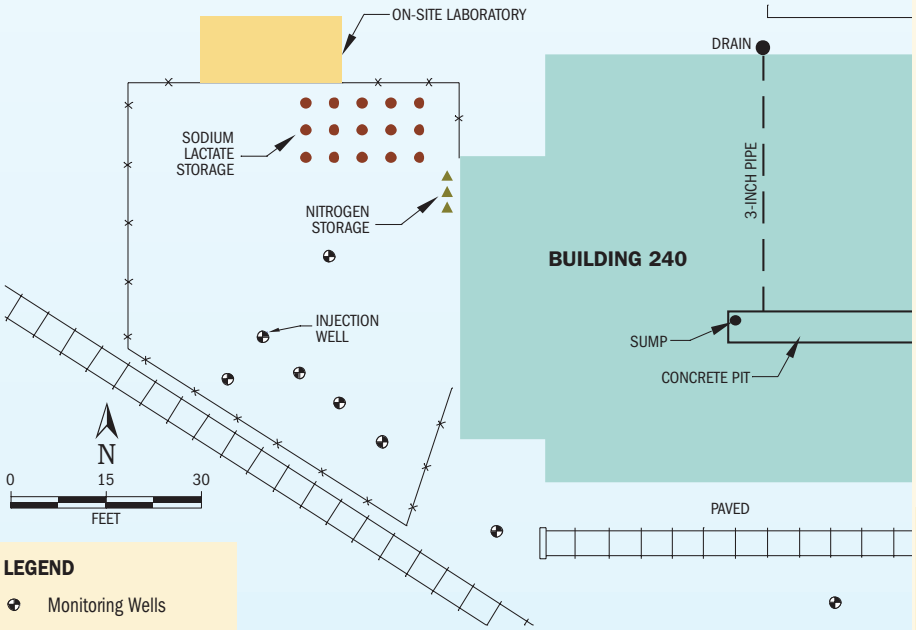
Sodium lactate was used as a nutrient enhancement product to stimulate the microbial activity of bacteria and accelerate bioremediation. The compound enhances microbial growth, which increases the rate of anaerobic biodegradation of VOCs (chlorinated solvents) in groundwater. Sodium lactate is a nonproprietary, environmentally safe substance used in the food processing industry. The compound is basically a solution of sugars and water that has undergone a fermentation process and is completely soluble in water.

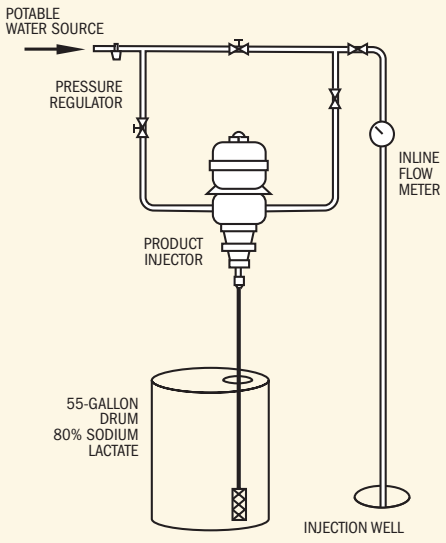
Pilot Test Results: Following sodium lactate injection, field measurements indicated that conditions conducive for bioremediation were becoming more favorable and between the September and October sampling rounds, PCE was dramatically transformed or converted by the biodegradation process to DCE (another VOC) in the area adjacent to the injection well, as measured by three adjacent monitoring wells.

The biodegradation, also referred to as a transformation or conversion, occurred when microorganisms present in the groundwater "consumed" or "dechlorinated" the chlorine atoms of the VOCs. At the conclusion of the test, an analysis of monitoring well data was conducted. An area approximately 40 feet in diameter centered over the injection well exhibited transformation from PCE to DCE.

PCE was transformed entirely to DCE in most of the pilot test area; however, the complete conversion to harmless by-products (water, chlorides, ethane, carbon dioxide) was not observed. Results are on Figure 5 on page 11. However, the hazards associated with the groundwater at the Site 40 test area were significantly reduced with the transformation of PCE to DCE, a less harmful substance. Complete conversion would occur when the microorganisms convert DCE to harmless by-products. In order to characterize the bacterial community stimulated at Site 40, samples were collected three times during the pilot test for further analysis at the University of California, Berkeley. The analysis indicated that the partial conversion observed in the pilot test may be the result of a

***FIGURE 4:* Pilot Test Layout**





Tap water from the hose valve at Building 240 was mixed with sodium lactate solution, then pumped into the injection well to the VOC plume beneath the site. The injector system was powered solely by the water pressure from the tap.

Words in ***bold italic*** type are defined in the glossary on page 7.

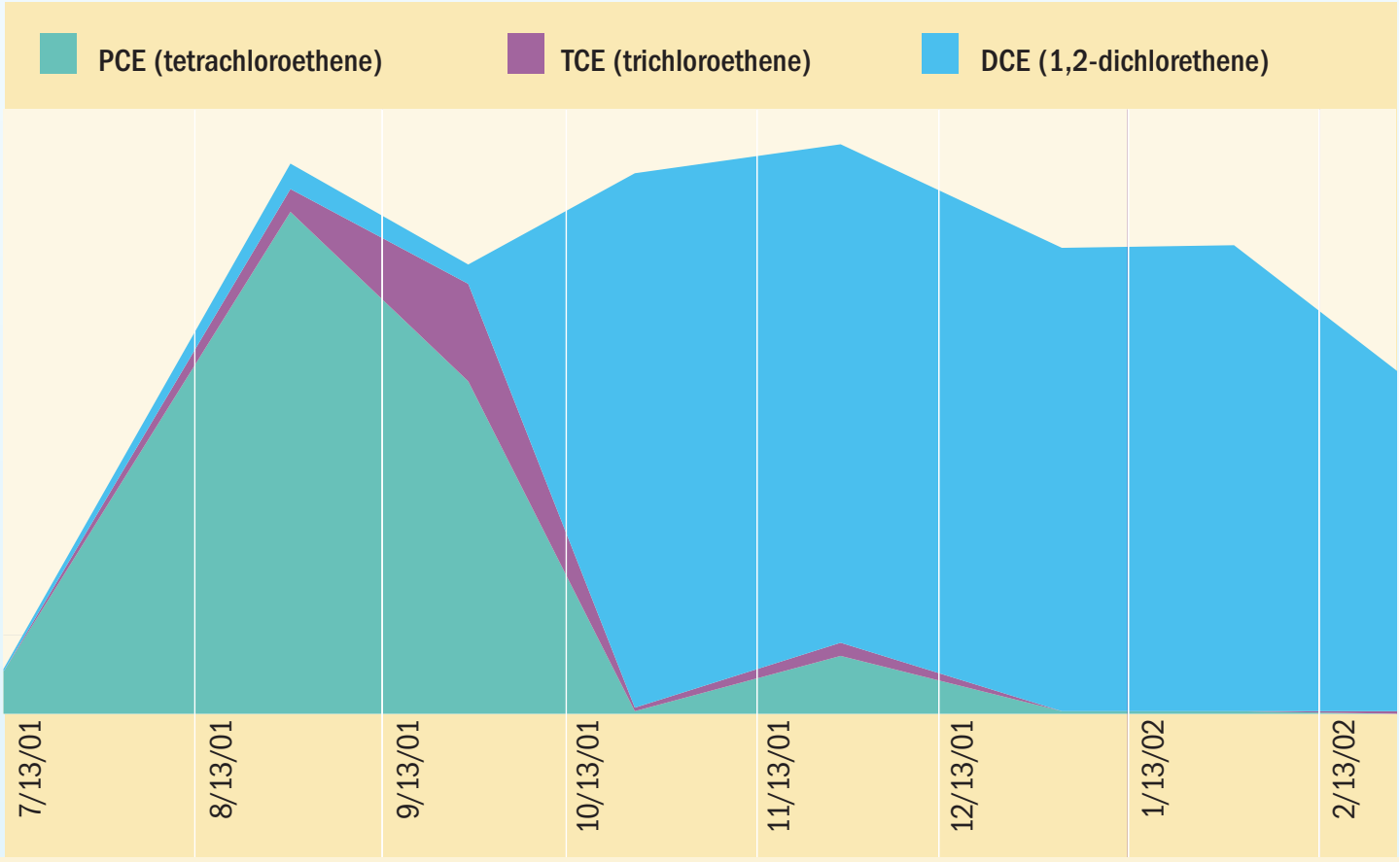
biological limitation at the site. This limitation could be overcome with the placement of additional microorganisms into the groundwater to complete the conversion.

Pilot Test Conclusions: The ISB pilot test confirmed that addition of sodium lactate to the groundwater successfully stimulated significant biological activity and that the appropriate conditions for complete conversion of VOCs were created at Site 40. However, site limitations, most likely a lack of the specific bacteria that convert DCE to harmless by-products, were encountered.

To further enhance technology performance, the Navy is pursuing additional refinements, including, but not limited to, introduction of additional bacteria from other locations that are known to be capable of fully biodegrading chlorinated solvents (a process known as bioaugmentation). This could be tested during the remedial design phase if this technology is selected as the final remedy for groundwater cleanup at Site 40.

The fenced-off area at Building 240 is the location where the Site 40 in situ bioremediation pilot test was conducted. Workers are getting ready to inject the sodium lactate solution into the groundwater. The pilot test was conducted to determine the effectiveness of this technology for enhancing the biodegradation process that occurs in groundwater when microorganisms convert VOCs to harmless by-products.

FIGURE 5: ***Representative Results—Site 40 Pilot Test Monitoring Well***



This figure illustrates the conversion of PCE and TCE to DCE over time during the pilot test.

Summary of Groundwater Cleanup Action Alternatives

Based on the investigation conclusions for Site 40, the Navy developed remedial or cleanup action objectives that shaped the development of several remedial alternatives. The focus is on protecting public health and the environment and cleaning up the water in the shallow aquifer. Specific objectives are to:

- Reduce the concentrations of VOCs (PCE and TCE) in groundwater to levels consistent with site cleanup goals/maximum contaminant levels. (Maximum contaminant levels for both PCE and TCE are 5 micrograms per liter.)
- Prevent or limit VOC migration beyond the current depth and boundaries of the plume.
- Protect human health by preventing exposure (ingestion, direct contact, and inhalation) of VOC-contaminated groundwater to potential receptors (future residential groundwater users).
- Protect potential ecological receptors at the Seal Beach National Wildlife Refuge.

Feasibility Study (FS)—Development of Remedial Alternatives for Site 40

A feasibility study (FS) was performed to develop and evaluate a range of alternatives to determine the most effective methods for meeting the remedial action objectives. The first step in the FS process was to identify and evaluate a broad range of technologies with potential for accomplishing cleanup objectives. Technology types examined included:

- Institutional (land-use) controls to limit exposure to VOCs,
- Monitoring to track groundwater conditions,
- Monitored natural attenuation (MNA) that relies on naturally occurring processes to reduce the amount of VOCs present,
- Containment technologies to eliminate or reduce exposure routes or reduce movement of contaminants,
- *In situ* treatment which treats groundwater in place in the subsurface,
- *Ex situ* treatment to treat groundwater once it has been extracted to the surface,
- Disposal technologies to transfer or discharge untreated wastes or residual wastes after treatment to regulatory-approved on-Station or off-Station locations, and
- Vapor-phase treatment of VOCs, often used as a secondary treatment process, that may be necessary for destroying residual vapors that may be present following extraction and treatment of VOC-contaminated groundwater.

Remedial technologies were then identified for screening and evaluation on the basis of effectiveness, implementability, and cost, consistent with U.S. EPA and NCP guidance. Effectiveness was given the most weight, followed by implementability, then cost. The most effective technologies were developed into remedial alternatives and subjected to detailed evaluation.

Alternative 1—No Action

As required by the NCP, the No Action alternative serves as a baseline for evaluating the other alternatives. In Alternative 1, there are no actions taken to collect, contain, or treat VOC-contaminated groundwater. No institutional controls would be implemented to prevent exposure or use of VOC-contaminated groundwater, or to control site access.

Alternative 2—Monitored Natural Attenuation (*MNA and institutional controls*)

Monitored natural attention or MNA relies on natural processes occurring in the subsurface, such as chemical reactions, to reduce the concentrations of compounds in the plume over time to reach the cleanup goals. MNA also includes other naturally occurring physical processes such as dilution and dispersion. For VOCs in groundwater, natural biodegradation processes involving microorganisms (bacteria present in the groundwater) gradually consume VOC molecules, converting the compounds to harmless, nonhazardous by-products. During this process, the microorganisms consume the chlorine atoms of naturally occurring compounds, as well as those of VOCs that were released to the environment as a result of past maintenance activities conducted at the locomotive repair facility at Site 40.

Alternative 2 also includes a long-term groundwater monitoring program and institutional controls. Monitoring would be used to track the VOC plume over time to verify that MNA biodegradation processes are occurring at a sufficient rate to achieve remedial action cleanup objectives. Additional wells would be installed to track the extent of the plume. The long-term monitoring plan would contain guidance for conducting potential actions if the plume expands in the future.

Institutional (land-use) controls would be used to prevent inadvertent exposure or extraction and use of contaminated groundwater, protect groundwater monitoring wells, grant access for well installation and sampling, or to perform other remedial measures if any are needed in the future. The Navy would implement institutional controls through the NAVWPNSTA Seal Beach Base Master Plan. These controls would remain in effect until site cleanup goals are met. Computer modeling indicates that Alternative 2 would reduce the concentrations of VOCs in the plume to below site cleanup goals in 26 to 36 years.

Alternative 3—Hydraulic Containment (*hydraulic containment, MNA, and institutional controls*)

Hydraulic containment would consist of placing extraction wells at the leading edge of the plume to extract groundwater, thus creating a hydraulic barrier to effectively restrict further migration of VOCs within the shallow aquifer. Extracted

Words in ***bold italic*** type are defined in the glossary on page 7.

groundwater would be pumped to a holding tank and then treated at a treatment facility to remove VOCs using a ***granular activated carbon (GAC) adsorption*** system. Contaminants in the extracted groundwater would adhere or stick to the carbon granules in the treatment system. After treatment, the clean water would be discharged to an outfall point approved by the RWQCB. A discharge plan that meets RWQCB requirements would be developed during the remedial design. The extraction and treatment system would operate until it is no longer technically feasible to reduce VOC concentrations using this active treatment process. Computer modeling indicates that the system would need to operate for 5 years. From that point on, MNA would further reduce VOCs in the plume below site cleanup goals. Long-term monitoring would verify the effectiveness of Alternative 3. Institutional controls would also be implemented. Computer modeling indicates Alternative 3 would reduce VOCs in the plume to concentrations below site cleanup goals after 32 years.

Alternative 4—Pump and Treat (*pump and treat combined with hydraulic containment, MNA, and institutional controls*)

Alternative 4 combines the components of Alternative 3 with a pump-and-treat option that would shorten the time to remediate VOC-contaminated groundwater. The pump-and-treat component would involve configuring extraction wells to provide optimal contaminant removal while also maintaining the hydraulic barrier and containment at the leading edge of the plume. Hydraulic containment would effectively restrict further movement of VOCs within the shallow aquifer. Extracted groundwater would undergo granular activated carbon or GAC treatment. Treated water would be discharged in the same manner as Alternative 3. After the pump-and-treat and containment phase, which would significantly reduce VOC concentrations in the plume, MNA would complete the cleanup of the groundwater. Institutional controls would also be implemented. Computer modeling indicates that the pump-and-treat system would operate for 1 year and MNA would take an additional 25 years to reduce VOCs in the plume to below site cleanup goals.

Alternative 5a—*In Situ* Treatment—Enhanced Bioremediation (*enhanced bioremediation, MNA, and institutional controls*) *Preferred Remedy*

Alternative 5a involves the application of enhanced *in situ bioremediation* (ISB) technologies to the contaminated groundwater to accelerate natural biodegradation and reduction of VOCs in the plume. Alternative 5a would accelerate the natural attenuation processes already acting on contaminants in the groundwater at Site 40, specifically the naturally occurring biodegradation processes. The bioremediation process applied would enhance the biodegradation and breakdown of PCE, the predominant VOC in Site 40 groundwater, into harmless by-products. As recommended in the FS Report, pilot-scale tests were conducted at Site 40. These tests verified the ability of this technology to accelerate the biodegradation process (see page 10 for more information on the pilot test).

For Alternative 5a, it was assumed a solution of sodium lactate and tap water would be injected into the VOC plume to enhance microbial growth, which increases the rate of anaerobic biodegradation of VOCs in groundwater. Sodium lactate is a nonproprietary, environmentally safe substance used in the food processing industry. The compound is basically a solution of sugars and water that has undergone a fermentation process. As planned for use at Site 40, sodium lactate will not harm soil, groundwater, vegetation, or wildlife. The objective would be to accelerate reduction of VOCs. It was assumed that 12 injection wells would be installed, dilute (3- to 30-percent) sodium lactate solution would be injected biweekly, and the amount of VOCs in groundwater could be significantly reduced in approximately 1 year.

Following initial enhancement treatment, MNA and associated follow-up monitoring would be conducted in a manner similar to the other alternatives. Institutional controls would be implemented. To reach site cleanup goals, it was estimated that *in situ* enhanced bioremediation would be completed in 1 year and MNA would be conducted until cleanup goals are achieved, which is estimated to take 5 years.

Alternative 5b—*In Situ* Treatment—Chemical Oxidation (*chemical oxidation, MNA, and institutional controls*)

Alternative 5b would employ an *in situ* chemical oxidation process to convert VOCs in the plume to water and carbon dioxide. For the FS, it was assumed that a proprietary process would be employed, although the actual process would be determined during remedial design. The chemical oxidation process would require bench- and/or pilot-scale testing to verify effectiveness and provide actual cost and performance data. The process evaluated for Alternative 5b involves injection of a diluted mixture of stabilized hydrogen peroxide into the VOC plume via injection wells. This is followed by an injection of an iron catalyst. The reaction of the hydrogen peroxide and the iron catalyst generates an oxidizing agent that reacts with the VOCs to produce water, chlorides, ethane, and carbon dioxide. Using 30 injection wells, the reduction of VOCs is expected to be achieved with two sequential treatment events. Groundwater monitoring at the site would be conducted to verify treatment efficiency. MNA would then be used to complete the cleanup of the plume until remediation goals are met. Additional monitoring would also track any movement of contaminants beyond the treatment area. Monitoring would also support future assessments of the effectiveness of natural attenuation. Institutional controls would be implemented. To reach site cleanup goals, it was estimated that *in situ* chemical oxidation would be completed in 1 year and MNA would be conducted until cleanup goals are achieved, which is estimated to take 5 years.

Evaluation of the Site 40 Groundwater Cleanup Alternatives

Each Site 40 alternative has undergone detailed evaluation and analysis, following the nine criteria developed by the U.S. EPA. These criteria are categorized into three general groups: threshold criteria, primary balancing criteria, and modifying criteria. Threshold criteria must be satisfied in order for an alternative to be eligible for selection. Primary balancing criteria are used to weigh major tradeoffs among alternatives. Generally, modifying criteria are taken into account after public comment is received on the Proposed Plan and reviewed with the various state regulatory agencies to determine if the preferred alternative remains the most appropriate remedial action. Table 2 below shows a cost comparison of the alternatives. Table 3 on page 15 summarizes the comparative analysis of all the alternatives.

A. THRESHOLD CRITERIA

Overall Protection of Human Health and the Environment—assesses whether an alternative provides for adequate protection of public health and the environment by eliminating, reducing, or controlling risks through treatment, engineered response actions or controls, or institutional and regulatory controls.

Alternative 1, No Action, does not protect human health and the environment because no institutional controls would exist to prohibit extraction of contaminated groundwater. The No Action alternative is used as a baseline for evaluating the other alternatives. Alternatives 2 through 5 meet the threshold criteria for overall protection of human health and the environment.

***TABLE 2:* Cost Estimate Summary of Remedial Alternatives[a]**

Alternative	Capital Cost	O&M Cost	Total Cost	Years to Complete Cleanup
Alternative 1, No Action	$0	0$	$0	36
Alternative 2, MNA	$0.4 million	$0.6 million	$1.0 million	36
Alternative 3, Hydraulic Containment	$0.5 million	$0.7 million	$1.3 million	32
Alternative 4, Pump and Treat	$0.5 million	$0.6 million	$1.1 million	26-36
Alternative 5a, *In Situ* Enhanced Bioremediation Treatment *[Preferred Remedy]*	$0.4 million	$0.4 million	$1.1 million	5[b]
Alternative 5b, *In Situ* Chemical Oxidation Treatment	$1.7 million	$0.4 million	$2.1 million	5[b]

In accordance with U.S. EPA guidance for developing and documenting cost estimates, the estimates presented are contingent upon a -30 to +50 percent accuracy. Cost estimates prepared for the FS Report can increase during the design and/or implementation phases as a result of unforeseen conditions or items or additional pilot tests that are not reflected in the conceptual plans used as a basis for comparison.

Acronyms/Abbreviations/Definitions

MNA—monitored natural attenuation
O&M—operation and maintenance
Capital Cost—costs required for construction (design, build, install) of a remedial action (e.g., groundwater treatment system and related site work).
O&M Cost—post-construction costs necessary to ensure or verify the continued effectiveness of a remedial action, mostly on an annual basis, plus periodic costs occurring once every few years (e.g., monitoring, 5-year reviews, and associated professional/technical services).
Total Cost—sum of capital and O&M costs, total cost of remedy.
Net Present Value—amount of money that, if invested in the initial year of the remedial action and disbursed as needed, would be sufficient to cover all costs associated with the alternative (based on July 2000 dollars).

Notes

a—All costs given as net present value.
b—Alternatives not modeled, total cost assumes cleanup goals will be achieved in 5 years.

Words in ***bold italic*** type are defined in the glossary on page 7.

TABLE 3: *Summary of Comparative Analysis of Site 40 Remedial Alternatives*

Preferred Remedy ★

Criterion	Alternative 1 No Action	Alternative 2 Monitored Natural Attenuation	Alternative 3 Hydraulic Containment	Alternative 4 Pump and Treat	Alternative 5a *In Situ* Treatment Enhanced Bioremediation	Alternative 5b *In Situ* Treatment Chemical Oxidation
1. Overall Protection of Human Health and the Environment	Not Protective	Protective	Protective	Protective	Protective	Protective
2. Compliance with ARARs	Not Applicable	Complies	Complies	Complies	Complies	Complies
3. Long-Term Effectiveness and Permanence	○	◒	◒	◒	◒	◒
4. Reduction of Toxicity, Mobility, or Volume through Treatment	○	○	◒	◒	◒	●
5. Short-Term Effectiveness	○	○	○	○	●	◒
6. Implementability	●	●	◒	◒	○	○
7. Cost	●	◒	◒	◒	◒	○
8. State Acceptance—State concurs with the preferred remedy, performance criteria to be determined for all other alternatives.						
9. Community Acceptance—This criterion will be addressed in the Record of Decision.						

○ Low ◒ Medium ● High

For the Primary Balancing Criteria 3 through 7 above, please see the text on pages 15 and 16 for a further explanation of the ratings.

Compliance with *Applicable or Relevant and Appropriate Requirements (ARARs)*—evaluates whether an alternative complies with all federal, state and local environmental statutes, regulations, and other requirements, or whether a waiver is justified. (ARARs are discussed in greater detail on page 17 in the fourth bullet.)

Potential ARARs do not apply to Alternative 1 because no action is being taken. Alternatives 2, 3, 4, 5a, and 5b comply with all ARARs.

B. PRIMARY BALANCING CRITERIA

Long-Term Effectiveness and Permanence—considers the ability of an alternative to maintain protection of human health and the environment over time after remediation is complete.

Alternative 1 rates low in long-term effectiveness and permanence because plume migration patterns and effectiveness of natural attenuation processes would not be monitored and verified to demonstrate protectiveness.

Alternatives 2, 3, 4, 5a, and 5b rate medium for long-term effectiveness and permanence. Alternative 2 relies solely on MNA, which is also a follow-up treatment component for Alternatives 3, 4, 5a, and 5b. For Alternatives 3, 4, 5a, and 5b, various degrees of MNA are incorporated to further reduce contaminant concentrations after initial treatment processes have concluded. Until cleanup levels are reached, institutional controls are used by all the action alternatives to prevent human exposure to VOCs.

Reduction of Toxicity, Mobility, or Volume through Treatment—refers to the degree to which an alternative uses treatment technologies to reduce: 1) harmful effects to human health and the environment (toxicity), 2) contaminant's ability to move (mobility) in the environment, and 3) the amount of contamination (mass and volume).

Alternatives 1 and 2 rate lowest in reduction of toxicity, mobility, or volume through treatment because there is no active treatment associated with either alternative. Alternatives 3 and 4 rate medium in this criteria because operation of the groundwater extraction system would significantly reduce the volume and mass of VOC contamination in the groundwater. VOCs would be treated using a GAC (granular activated carbon) system on-site. When the GAC has adsorbed all the contamination it is capable of, it is shipped to an off-site facility to undergo a thermal regeneration process that removes the adsorbed contaminants from the GAC. Alternative 5a rates medium in this criteria because, although *in situ* bioremediation is expected to greatly accelerate biodegradation, pilot tests have not yet been successful in completely converting PCE to harmless by-products. Alternative 5b rates highest for this criteria because the *in situ* chemical oxidation process is an aggressive technology that could quickly and directly convert halogenated VOCs such as PCE and TCE to non-toxic inert compounds.

CONTINUED ON PAGE 16 ▶

CONTINUED FROM PAGE 15

Short-Term Effectiveness—considers the impact of an alternative relative to human health and the environment during the construction and implementation phase and until remedial action objectives are achieved. Also considers time to achieve cleanup goals.

Alternatives 1, 2, 3 and 4 rated low in short-term effectiveness, due to the extended duration required to achieve cleanup. Alternative 5a rated high in this criteria because *in situ* bioremediation technology would accelerate biodegradation processes. There would be minimal short-term risks to workers, base personnel, and the surrounding community due to the benign nature of the treatment reagent used (sodium lactate and tap water) and passive treatment mechanisms. Alternative 5b rated medium in short-term effectiveness; although aggressive treatment of VOCs would occur, there are potential short-term risks to workers and base personnel because the process uses hazardous treatment reagents (diluted hydrogen peroxide). Alternatives 5a and 5b are expected to achieve cleanup goals in the shortest period of time.

Implementability considers the technical feasibility (how difficult the alternative is to construct and operate) and administrative feasibility (coordination with other agencies) of implementing an alternative.

The absence of field construction or other remedial activities under Alternative 1, and the limited scope of groundwater monitoring under Alternative 2, make each of these options readily implementable from a technical viewpoint. The technical feasibility of Alternative 3 and Alternative 4 is rated medium. Although both would use reliable, widely available technologies, implementation is somewhat complicated by the presence of an active maintenance operation. Alternatives 5a and 5b rate low in implementability. The *in situ* bioremediation (Alternative 5a) and chemical oxidation (Alternative 5b) technologies are considered innovative, require specialized knowledge and expertise to apply, and can often require a complicated, step-by-step implementation process. Pilot tests conducted for Alternative 5a indicate this alternative would be challenging to implement because of the potential need for post-treatment technologies and/or technology refinements.

The institutional controls in the form of land-use and water-use restrictions required by Alternatives 2, 3, 4, 5a, and 5b are considered administratively feasible and are not expected to prevent future operations at NAVWPNSTA Seal Beach.

Cost—includes estimated capital and annual operations and maintenance (O&M) costs and present worth costs. Present worth is the total cost of an alternative over time and all estimates are expressed in terms of year 2000 dollars.

The estimated costs for the six remedial alternatives are summarized on Table 2 on page 14. Alternative 1 is rated highest because there are no costs associated with this alternative. Alternatives 2, 3, 4, and 5a rate medium in cost, with net present value ranging between $1.0 and $1.3 million. The additional cost for bioaugmentation associated with Alternative 5a is minimal and would not have a significant impact on the estimated cost presented in this Proposed Plan to implement this alternative. Alternative 5b is the most expensive alternative for Site 40, owing to the costs for a chemical delivery system, reagent materials, and operational labor.

C. MODIFYING CRITERIA

State Acceptance—considers whether the State of California's environmental agencies agree with the analysis presented in the RI/FS reports and the Navy's preferred remedy.

State of California representatives from the DTSC and the RWQCB concur with the selection of Alternative 5a, the Navy's preferred alternative.

Community Acceptance—evaluates whether the local community agrees with the Navy's analysis and if the community has a preference for an alternative.

This Proposed Plan is the Navy's request to the community to comment on the ERSE and FS reports, remedial alternatives developed, and the Navy's preferred alternative. Responses to comments received from the public will be addressed in the Record of Decision/Final Remedial Action (ROD/RAP), see "Next Step for Site 40" on page 18.

FOR MORE INFORMATION

The Navy encourages community involvement in the IR Program at NAVWPNSTA Seal Beach. For more information, or if you have any questions or concerns about environmental activities, please contact:

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Words in ***bold italic*** type are defined in the glossary on page 7.

Site 40 Preferred Remedy—Alternative 5a

IN SITU TREATMENT—ENHANCED BIOREMEDIATION

The Navy's preferred remedy for cleanup of Site 40—Alternative 5a—would consist of *in situ* bioremediation (ISB) treatment using a sodium lactate solution to enhance biodegradation of VOCs (industrial solvents) in the groundwater, followed by MNA (monitored natural attention), and institutional controls. A mixture of sodium lactate and tap water would be injected into the VOC plume. Sodium lactate provides a nutrition source that enhances the ability of the bacteria present in groundwater to consume VOCs. This process, also called biodegradation, should ultimately convert the VOCs to nonhazardous and harmless by-products of carbon dioxide, chloride, and water. The injection system would be installed over a 40,000 square foot area. MNA, the follow-up treatment step, would complete the cleanup process. Institutional controls would protect against any activities that would interfere with implementation of the alternative. After undergoing evaluation using the nine criteria, Alternative 5a is the most viable alternative.

Rationale for the Navy's Preferred Remedy

Key points that support the Navy's preference for Alternative 5a are listed below.

- Protective of human health and the environment. Provides short-term protection since most of the VOC contamination in the plume would be biodegraded during the first year of remedy implementation. Institutional controls prevent against inadvertent exposure to contaminated groundwater.
- Provides long-term protection since it would permanently treat VOC-contaminated groundwater within the plume boundaries shortening time to reduce VOC concentrations to meet cleanup goals. Permanently reduces the toxicity, mobility, and volume of contamination in groundwater.
- Incorporates an innovative cleanup technology, as encouraged by the U.S. EPA and the Interstate Technology Regulatory Council.
- Alternative 5a is capable of meeting potential federal or state (if more stringent) environmental standards, requirements, criteria, or limitations that are determined to be legal and applicable or relevant and appropriate requirements (ARARs) for cleanup of VOC-contaminated groundwater at Site 40. Potential ARARs are presented in the Final Groundwater Feasibility Study Report, Sites 40 and 70 (June 2002), available at the information repositories listed on page 9. Final ARARs are documented in the Record of Decision/Final Remedial Action Plan after the final remedy for Site 40 is selected.
- Considered to be cost-effective at achieving remedial action objectives. Accelerated cleanup in the first year results in lower follow-up operation and maintenance costs for the MNA component of the remedy.
- The pilot test at Site 40 has shown the ISB technology to be effective and reasonably efficient to implement. The ISB pilot test confirmed that the addition of sodium lactate to groundwater can successfully stimulate significant biological activity and that the appropriate conditions for complete conversion of VOCs can be created and maintained. The pumping of a mixture of sodium lactate and tap water into the subsurface is an environmentally safe procedure. Sodium lactate is a proven, safe substance that is used in the food processing industry. As planned for use at Site 40, sodium lactate will not harm soil, groundwater, vegetation, or wildlife.
- When Alternative 5a, the preferred remedy, is compared with Alternative 2, (MNA with Institutional Controls, which scored next highest in the balancing criteria portion of the evaluation of the alternatives), the time frame to meet site cleanup goals is significantly accelerated. The ISB pilot test at Site 40 demonstrated that Alternative 5a, without any further refinements to enhance performance, will rapidly (within months) convert PCE to DCE. Under Alternative 2, which does not contain an active remediation component, but relies solely on natural biological processes, this conversion would take many years. Technology performance demonstrated to date indicates that Alternative 5a will achieve site cleanup goals in an accelerated manner. To further accelerate the cleanup process, technology refinements, such as bioaugmentation, can be evaluated through additional pilot testing. If such refinements are proven successful, they can be readily implemented during remediation.

Multiagency Environmental Team Concurs with the Navy's Preferred Remedy for Site 40

The NAVWPNSTA Seal Beach Installation Restoration Program cleanup team partnership, consisting of the Navy, Cal/EPA's Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board (RWQCB), and the Orange County Department of Environmental Health Services, was established in 1991. At that time, these agencies agreed to work together to meet the environmental obligations of the Navy and the other agencies. The formal agreement between the agencies is known as the Federal Facility Site Remediation Agreement. The primary goals stated in the formal agreement are to protect human health and the environment, expedite environmental cleanup, and coordinate environmental investigations and cleanup at the Station.

These agencies have reviewed all major documents and activities associated with Site 40. Particular emphasis was placed on the ERSE report and risk-screening documentation, groundwater monitoring program reports, the FS report, and pilot study documents. Based on reviews of these reports, the cleanup team partners concur with the Navy's recommendation of Alternative 5a, *In Situ* Treatment, Enhanced Bioremediation, as the preferred remedy for addressing the VOC plume of contaminated groundwater at Site 40. In addition, the agencies concur with the Navy that no further action is needed for soil at Site 40.

NEXT STEP FOR SITE 40: PUBLIC COMMENTS

Comments on this Proposed Plan received during the 30-day public comment period (August 29–September 27, 2003) and at the September 16, 2003 public meeting will be considered in the final environmental determination for Site 40. At the public meeting (see page 1 for location), community members may submit oral or written comments. Public comments will be accepted on all the alternatives for Site 40 outlined in this Proposed Plan and on information presented in the ERSE and FS reports. During the public comment period, community members may submit written comments by mail, fax or e-mail (**postmarked or sent no later than September 27, 2003**) to:

Ms. Pei-Fen Tamashiro (Code: N45WW)
IR Program Manager
NAVWPNSTA Seal Beach
800 Seal Beach Blvd., Building 110
Seal Beach, CA 90740
Fax: (562) 626-7131
E-mail: tamashiro.peifen@sbeach.navy.mil

Community members may also attend the September 16, 2003 public meeting held during the public comment period. Navy representatives will make a presentation on the Site 40 environmental investigations and the cleanup alternatives evaluated. You will have the opportunity to ask questions and formally comment orally or in writing on the preferred remedy and the other alternatives. Following the public comment period, the next step in the IR Program process is the Record of Decision/Final Remedial Action Plan (ROD/RAP) that formally documents the selected remedy for Site 40. A Responsiveness Summary containing responses to comments provided at the public meeting and during the public comment period will accompany the ROD/RAP.

After the ROD/RAP is signed by the Navy and the regulatory agencies, the remedial design and remedial action phases begin. Remedial design involves developing detailed designs for the selected remedy. Design documents undergo Navy and regulatory agency review. Remedial action refers to the construction, testing, and operation of the selected remedy. Regulatory agencies also provide oversight during this phase. After the remedial design is completed, it will be described in a fact sheet produced for the general public.

Words in ***bold italic*** type are defined in the glossary on page 7.

Restoration Advisory Board

COMMUNITY PARTICIPATES IN NAVY'S ENVIRONMENTAL PROGRAM

The NAVWPNSTA Seal Beach Restoration Advisory Board (RAB) was established in January 1995 to increase public participation in the environmental restoration program at the Station. The RAB is made up of community members and representatives of various organizations who are interested in the progress of the IR Program. It provides a forum for community members, the Navy, and regulatory agencies to discuss cleanup issues and approaches. RAB members review and comment on environmental documents, attend meetings every other month, and act as a liaison between the Station's environmental program and the community.

The RAB currently meets in the evening on the second Tuesday every other month. The meetings are open to the public and are announced through mailers sent to all names on the Station's community mailing list. The RAB and the Navy encourage members of the public to attend the meetings. For more information about the next NAVWPNSTA Seal Beach RAB meeting, contact Ms. Joan "JP" Peoples, Community Co-Chair at (562) 592-5606. To add your name to the community mailing list, fill out and send in the mailing list request form or use the e-mail option (see below).

NAVWPNSTA Seal Beach Community
MAILING LIST REQUEST

☐ Add me to the NAVWPNSTA Seal Beach Community mailing list.

☐ Send me Restoration Advisory Board information.

Name: ☐ Mr. ☐ Mrs. ☐ Ms. _____

Affiliation: _____

Address: _____

_____

City: _____ State: _____ Zip _____

Telephone: _____ Fax: _____

I would like my name entered as:

☐ a resident ☐ representing an organization

☐ a business ☐ an elected city, county, or state official

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Please clip and mail these coupons to:

Naval Weapons Station Seal Beach
Ms. Pei-Fen Tamashiro (Code: N45WW)
800 Seal Beach Blvd., Building 110
Seal Beach, CA 90740

E-mail option:
If you prefer to use e-mail, include the information requested in the coupons above and send it to:
Ms. Pei-Fen Tamashiro at tamashiro.peifen@sbeach.navy.mil

Words in ***bold italic*** type are defined in the glossary on page 7.

Ms. Pei-Fen Tamashiro (Code: N45WW)
NAVWPNSTA Seal Beach
800 Seal Beach Blvd., Building 110
Seal Beach, CA 90740

Address Correction Requested
If you wish to be added to the mailing list, or no longer wish to receive mailings, please contact Ms. Pei-Fen Tamashiro at (562) 626-7897, or return this page with address label attached.

What's Inside?

Proposed Plan/Draft Remedial Action Plan Installation Restoration Program—Site 40

Navy Proposes Groundwater Cleanup Plan, Requests Public Comments